

THE TERNS OF THE WEEPECKET ISLANDS, MASSACHUSETTS.

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The preservation and gradual increase of the various Tern colonies along the Massachusetts coast is largely due to the interest and attention of Mr. George H. Mackay, who has kept us informed of the progress of the colonies at Penekese and Muskeget. Attention was called to a small colony of terns at the Weepecket Islands, in 1896, by Mr. Reginald Heber Howe, Jr., who reports the results of two visits to these islands on June 27 and 30, 1896, in the Auk for April, 1897, page 203. The results of Mr. Howe's study may be briefly summarized.

On the outer island about fifty birds were flying about, but only three nests, each containing two eggs, were found. These nests were placed upon the edge of the plateau, well hidden in the grass and poison ivy. "The Roseate Terns (*Sterna dougalli*) were apparently the only inhabitants of this island."

About the same number of terns were counted above the Middle island, and two nests were found on the beach and two on the edge of the plateau concealed beneath the scrubby poison ivy. The most of the birds here were Roseates, but there were a few Common Terns (*Sterna hirundo*).

The population of Great Weepecket was studied on June 30. On the upland 25 nests were found, two empty, three with one egg, seven with two, twelve with three, and one with four, and one with a chick. On the beach eight nests were found, three with one egg, two with two, and three with three. Total, 34 nests.

"The nests on the uplands were in almost every case placed near or at the base of the scattered boulders, and on the beach on the sea weed. The colony consisted of perhaps 200 terns, the majority Roseates; but as the terns on the three islands all gathered over one when walking about the island, and others are off fishing, a correct estimate is impossible."

During nearly the whole of July and the first half of August the writer enjoyed unusual opportunities for studying the terns of these islands, and a comparison of conditions now with those of 1896 may prove interesting. The boats of the U. S.

Fish Commission and of the Marine Biological Laboratory were placed at my disposal, and it was due to the courtesy of these organizations that I was able to visit these islands on several different occasions for more or less extended study.

July 10, Mr. Irving A. Field, of the Fish Commission, accompanied me, when we made a pretty careful count of the nests on the three islands. On the outer small island we found 53 nests, the most of them among the weeds on the higher parts of the beach, concealed more or less. The top of this island was so densely covered with grass that but half a dozen nests could be accommodated along its edge. The lower beach nests were wholly exposed, and seemed to belong to the Common Tern, while the protected nests of the higher places appeared to belong to the Roseate Terns. It was possible to be absolutely accurate in identification only when there was a click in the nest. Most of the birds hovering above the island and making hostile demonstrations were Roseates.

Middle Weepecket contained but 19 nests, one of them containing five eggs. The position of the nests, as well as the actions of the birds flying about indicated that the Roseates were in the majority here, but not so much so as on the outer island. There were more nests on the top among the scrub poison ivy and grass, and fewer on the beach exposed.

Great Weepecket was the home of the Common Tern to the almost exclusion of the Roseate. Not more than three nests of the Roseate were positively identified here. The upper level is so much more extensive than the beach levels, and so well grown with poison ivy and bay berry bushes, and so broken up with hollows and elevations, that it was next to impossible to make an accurate count of the nests, or rather, to find all of them. 337 nests were found on the beach levels and 189 on the upper levels. Few or none were concealed by bushes or grass. One was found in an old wrecked dory, and two were placed partly under large boulders, but their situation could hardly have been for concealment. Very few of the eggs lay upon the bare ground. The nests were made of dry grasses, or dry sea weed, some being even elaborately made—for a tern.

One nest containing six eggs pretty clearly belonged to two birds; 13 contained five eggs; 22 contained four eggs. The

variation of the eggs in the nests containing but two eggs was so great that it was rarely possible to tell whether the nests of five belonged to two or to but one bird. That point can be settled only after careful study with the birds under close scrutiny.

Over 20 young birds unable to fly were counted on the three islands, but they were not considered in making an estimate of the population of the islands. 618 nests were actually found, thus arguing a population of 1,236 old birds. It is almost certain that many nests were overlooked, and it is not likely that many nests were counted twice. Probably an estimate of 1,500 old birds would be far within the facts. Thus it would appear that the rate of increase since 1896 has been enormous. On the two smaller islands the Roseates have more than held their own, while on the large island the Common Terns have come in hordes to possess it.

While there were more eggs than young birds and empty nests on the beach levels of the large island, on the upper levels the empty nests and young predominated. Apparently the first comers built their nests on the uplands by preference, while the later comers were either forced to occupy the lower levels or chose to do so. A little more care was manifest in the selection of a nesting site and in the construction of the nests on the uplands than on the beach. One might argue from this that the upland breeding birds were the more experienced, and therefore probably the older birds, but systematic study will be needed to prove it. The number of eggs in a nest also appeared to average larger on the uplands than on the beach levels.

It is common knowledge that tern eggs are protectively colored to simulate pebbles on the beach. Nests made of sea weed scattered among the pebbles were hard to see, because the color of the sea weed resembled the stones and the eggs. On the upper levels, however, and on the light colored sands among the grass, and where the nests were made of light colored fine grass, the eggs were easily detected by their bold blotches. They would have been less conspicuous little end up, but tradition forbade such an arrangement. Why tradition should permit the use of nonprotective nest material and not also furnish a degree of protection in either color or position

of the eggs is not clear. Perhaps she has not had time to complete her line of research yet.

It is also common knowledge that the downy young are protectively colored while on the beach, the mottling of the downs with tawny and dusky producing the effect of pebbles and small stones, and sea weed. It is interesting to notice that while the downy young of the Common Tern are thus mottled, the downy young of the Roseate Tern are longitudinally streaked from head to tail, the whole effect being decidedly darker. Incidentally, the legs and feet of the Roseate are dark, but of the Common almost orange, in the downy young. In both species the throat is dusky black, but the rest of the underparts, including the under side of the wings, are pure white. An explanation of this difference in pattern of coloration in the downy young of the two species is found in their habits and surroundings. I found young of the Roseate only on the uplands or among the weeds and grass of the upper beach slopes, always more or less concealed by the grass or weeds. Here the colors blend well with the surroundings. Many of the young of the Common Tern were on the beach and could be seen there with difficulty; but those which occupied the upland nests, or crouched among the grass and bushes were usually readily seen, because the mottled downs rather contrasted than harmonized with the surroundings. One is almost forced to the conclusion that the traditional nesting place of the Roseate is among grasses, while that of the Common is on the beach among pebbles and sea weed.

My work was a minute study of the nestling and juvenile plumages, but the results of that work can better await a more careful treatment than the limits of this paper make possible. It is sufficient to say that the body and inner wing markings of the juvenile Common Tern, on the dorsal side, give the effect of dark bars on a tawny or buffy ground, while the markings in the same regions of the Roseate give the effect of mottling in tawny and dark gray. As the two species crouched in the grass often side by side, it was easy to compare the relative protective effect of the two plumages which are really so much different in general effect. On the whole, it was a little more difficult to detect the young Common Tern than the young Roseate in the grass and bushes, but the young Roseate

was better concealed among the weeds with large leaves. Among the pebbles and stones the Common was the more readily seen. The underparts of the young Common were entirely pure white, but of the Roseate with a faint tint of cream or even rosy.

The Weepeeket terns seemed to feed almost wholly in the vicinity of Woods Holl. They ranged from Quisset to the bathing beach or even all along the west shore of Penzance, Great and Little Harbor, and the region of Vineyard Sound bordering the harbors, and in Hadley Harbor. Some range farther, of course, but the birds feeding young appeared to content themselves with the region named.

Unlike the gulls, the terns do not swallow the food and then regurgitate for the young, but carry the fish in the beak directly to the young. After studying the feeding process at close range for some time, I became convinced that the old birds do not stuff the fish down the throat of the young, but only thrust its head into the mouth far enough for the throat muscles to grip it, when the young bird swallows for himself. The Sand Lance (*Ammodytes americanus*) was the chief fish food, probably because it is so soft and easily digested. A four-inch fish could not manage to get wholly inside a four-inch bird, so the tail was left sticking out for future consumption! Even with the young able to fly the fish's head rested in the primitive gizzard while the tail was scarcely more than concealed in the throat. Mr. Field induced one Muskeget young Common Tern to part with his dinner of two young Herrings and one Sand Lance. Usually but a single fish was found in the digestive tract of the young.

The downy young merely raised their heads and opened their mouths for food, when very hungry uttering a faint peep, but the young ones able to fly were made to dance for their dinner. With widely gapping mouth and wings held akimbo, they executed a surprisingly fine clog to their own piercing music! In one case a young bird called for lunch just 20 minutes after receiving a good sized fish. He was not fed, however, until half an hour after his last lunch. I have repeatedly seen the old birds swallow three and four Sand Lances in rapid succession. This colony of 1500 old birds and their 1500

young must consume great quantities of the Sand Lance, yet the supply does not seem to diminish.

There is no uniformity in the development of the instinct to assume protective attitudes. With some young there is no evidence of such an instinct while they remain in the nest, while with others there seems to be almost as soon as the shell is cast. All of the young from the beginning of the pin feathers gave evidence of the instinct well developed. Some young left the nest two days after hatching, some remained for four days. When partly feathered birds on the uplands were taken from their hiding places in the grass or bushes their tendency was to try to run away instead of hiding again when replaced on the ground. Those on the beach treated the same way would invariably take to the water if not prevented. Even the young upon which the pin feathers were barely showing frequently took to the water and swam readily. In hiding, the birds were content to emulate the Ostrich, hiding only the head and often leaving the whole body exposed. They were always careful, however, to keep the white underparts well concealed.

In two cases that were under careful observation for some time both parents performed the office of incubation in regular turn. The one that I judged to be the female brooded the eggs, tucking them carefully under her feathers, but the male merely stood above them, apparently shielding them from the burning sun, while the female went for a lunch and bath. The incoming bird uttered a peculiar rattling sound just before alighting some 20 feet from the nest, when the brooding bird got up and immediately flew away. The relief carelessly sauntered toward the nest, made believe picking up food when it reached the nest, then stood over it a moment before settling down, if the female. Neither bird remained on the nest over an hour, the male usually less than forty minutes, not waiting for the female to appear every time before leaving.

It was interesting to watch the old birds come in with a fish dangling from the beak. As it passed close along the beach each young bird in turn clamored for the morsel. When the old bird approached the place where its young had been last seen it skimmed above the stones, halting now and then before a particularly vociferous youngster, then either passed on or circled

back to look farther, finally either finding its own young or going to another place where another young had been left. I was eager to know how the old birds could recognize their own offspring among the multitude which looked exactly alike to me. It seemed incredible that they depended upon sight, or why should they almost actually touch the young each time before deciding the matter? I was forced to the conclusion that the sense of smell must play an important part in the final determination.

Later in the season young birds were seen following the old birds to where they fished, all the while loudly calling for food. I was prepared to see the morsel delivered while the birds were still flying, after the manner of the swallows, but it was never so done. The young, at least, must first rest upon the water or land, then the old usually settled for the moment of the delivery, the young bird first shaking his feathers well before rising and following. During the second week in August young birds were to be seen and heard about Great Harbor and Penzance, but none appeared to be fishing for themselves. Up to this time there appeared no evidence that either the old or young had begun to molt.

The terns appear to fish in companies, following schools of fishes of any species which may be suitable for food, size of the individual fish appearing to be the prime requisite. The fishes actually found in the stomachs or protruding from the mouths of the young birds, and some found on the islands accidentally dropped by the birds, or dropped near the young, are as follows: Sand Lance (*Ammodytes americanus*), Cunner (*Tautoglabrus adspersus*), Mullett (*Mugil curema*), Pollack (*Pollachis virens*), Flounder (*Pseudopleuronectes americanus*), and young Herring (species not determined). Of all the food the Sand Lance comprised not less than 80 per cent.

It has been said that a tern never misses the fish which he dives for. I have seen many birds dive repeatedly without success. Most of the fish appeared to be grasped just a little in front of the middle, and were never struck with the closed bill, but grasped between the mandibles in every instance noticed. The fish are swallowed head first.

Many things in the life history of the terns need to be studied carefully before we can explain their true relationships with satisfaction.